

REMARKS/ARGUMENTS

Reconsideration and withdrawal of the outstanding ground of rejection is respectfully requested in light of the above amendments and the remarks that follow.

The Examiner has rejected claims 1, 2, 4-7, 9 and 10 under 35 U.S.C. 112, second paragraph, as indefinite. According to the Examiner, and with reference to independent claims 1 and 5, it is not clear how the elliptical-shaped core pin can reduce the stress of the fillet. The Examiner also contends there is a lack of antecedent basis in the specification for the claimed feature.

The Examiner's attention is directed to pages 5 and 6 of the specification wherein it is mathematically established that stress concentration becomes maximum for a circular-shaped hole, but that the stresses can be reduced proportionately with the elliptical ratio b/a . Thus, as explained in paragraph 22, equation (1) can be used as a means to reduce the concentrated stress at the internal blend or fillet 64 where the core support pin 60 connects with the main core body and where maximum stress otherwise occurs. In the above equation, and as explained in paragraph 21 (a) is the major axis radius of the elliptical hole and (b) is the minor radius of the elliptical hole. Thus, it is clear that an elliptical pin fixed within an elliptical hole (the core pin within the core) that stress can be reduced where the pin is joined to the core body through the utilization of an elliptical shape for the core pin and core hole. Thus, the claims are in full compliance with 35 U.S.C. 112, second paragraph. Moreover, stress reduction via the use of an elliptical shape is a well known phenomenon, not only recognized in the EP reference,

but also in literature prior to the EP reference. Thus, one of ordinary skill in the art would have understood how the elliptical shape of the pin reduces stress.

The Examiner has rejected claims 1, 2, 4-7, 9 and 10 under 35 U.S.C. 103 as unpatentable over the acknowledged prior art as set forth on pages 1, 2, 4 and 5 of the specification (in conjunction with Figures 1-4) and further in view of EP 1022434.

According to the Examiner, it would have been obvious to form the openings created by the support pin in the turbine bucket of the admitted prior art with an elliptical cross sectional shape in light of the EP '434 reference, in order to minimize stress concentration. The Examiner further contends that the use of a fillet to join the support pin to the core body would have been obvious.

Applicant has not attempted to claim the phenomenon of stress reduction through the use of elliptical, as opposed to round, shapes. Rather, applicant has discovered a new and unobvious application of this knowledge to a core support used in casting, in order to solve a manufacturing problem. Neither the problem nor the solution is suggested in the prior art.

In connection with the EP '434 reference, which is crucial to the propriety of the proposed combination, it is admittedly disclosed that ceramic cores are often used to form the cooling cavities and passages within airfoil portions of buckets and nozzles. The reference also states that:

...The ceramic core is essentially a solid body which is shaped to conform to the complex interior cooling passages of the bucket or nozzle (for simplicity, reference will be made herein simply to the "bucket," but it will be understood that the invention is applicable to both rotating buckets as

well as stationary nozzles). The core is placed within a casting mold prior to pouring of molten metal into the mold. The casting mold consists of a ceramic shell which confines the molten metal, forms the exterior shape of the bucket, and fixes the ceramic core within the bucket.

The '434 reference also speaks of cooling passage connectors used in cores for gas turbine buckets that are removed from the core prior to casting. The reference goes on to explain that prior practice includes tying the adjacent ceramic coolant passage sections with quartz cross ties to enhance stiffness of the bucket in the area of the coolant passages. The invention in the '434 patent relates to the cross-sectional shape of these cross ties and specifically to an elliptical cross tie shape designed such that, after the core is removed, the elliptical passages that remain in the bucket have reduced stress concentrations.

Thus, the EP '4343 reference also utilizes the known practice of adopting an elliptical shape to reduces stress, i.e., stress in the finished bucket is reduced in the area of the elliptical cooling holes.

There is no disclosure or suggestion in EP '4343, however, that such cross ties are also used to fix or support the core to the shell die itself during the casting process. Moreover, there is no disclosure or suggestion in the '434 patent of reducing stress in the cross ties themselves, or at locations where the cross ties are fitted to the core. Rather, the focus is on the elliptical passages that result after the cross ties have been removed. In other words, the EP '4343 reference is not at all concerned with insuring the stability of the core within the die, during the casting process.

Thus, there are two crucial distinctions in the EP '434 reference that would not have suggested application of any teaching therein to the acknowledged prior art so as to arrive at the claimed invention. First, there is no suggestion that the cross ties disclosed in EP '434 are used to support the core relative to the shell die.

Secondly, there is nothing in EP '434 suggesting any concern for or recognition of benefits in reducing stress in core supports and especially where the core supports are fitted to the core; or for increasing stiffness of the core supports to prevent breakage during casting. The Examiner may recall that one of the reasons for changing the shape of the core support pin and core support pin hole to an elliptical shape was to increase the core support pin stiffness, and thereby significantly reduce, if not eliminate, the likelihood of breakage of the core support (see page 6) during casting. EP '434 is not at all concerned with the manufacturing process or of how to best support the core within the shell die so as to avoid damage by reason of breakage of the core support during casting.

Absent any illumination on these two points, it is readily apparent that any combination of the EP '434 disclosure with the acknowledged prior art in such a way as to arrive to the claimed invention is necessarily based on the improper utilization of impermissible hindsight.

Applicant has amended claims 1 and 5 to more clearly recite the dual purpose of the core support pins during coating, and it is respectfully submitted that in this context, the claims clearly distinguish over the prior art as cited by the Examiner. The EP '434

WANG
Appl. No. 10/643,089
June 2, 2004

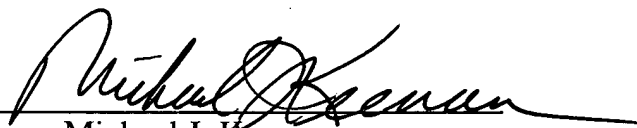
patent simply fails to suggest any remedy to problems associated with core supports during casting.

The application is now believed to be in condition for allowance, and early passage to issue is requested. The Examiner is requested to telephone the undersigned before issuing any final rejection for purposes of arranging an interview or to otherwise resolve any outstanding issues.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: _____

A handwritten signature in black ink, appearing to read "Michael J. Keenan", written over a horizontal line.

Michael J. Keenan

Reg. No. 32,106

MJK:ljb
1100 North Glebe Road, 8th Floor
Arlington, VA 22201-4714
Telephone: (703) 816-4000
Facsimile: (703) 816-4100